

American Computer Science League

2022-2023 • Contest 1: Short Problems • Junior Division

1. Computer Number Systems

Convert 2023_{10} to octal.

- A. 2023
- B. 3747
- C. 4040
- D. 4511
- E. 4737

2. Computer Number Systems

What is the value of $657383_{16} - 654321_{16}$ in base 8?

- A. 30242
- B. 31142
- C. 30152
- D. 30142
- E. 30132

3. Recursive Functions

Find $f(18)$ given:

$$f(x) = \begin{cases} f(x-3) + 1 & \text{if } x \geq 10 \\ f(x-2) - 3 & \text{if } 5 < x < 10 \\ x^2 & \text{if } x \leq 5 \end{cases}$$

- A. 18
- B. 19
- C. 20
- D. 21
- E. 22

4. Recursive Functions

Find $f(12, 21)$ given:

$$f(x, y) = \begin{cases} f(x-1, y+2) - 3 & \text{if } x > y \\ f(y-1, x+2) + 1 & \text{if } x < y \\ x & \text{if } x = y \end{cases}$$

- A. 13
- B. 18
- C. 20
- D. 15
- E. 12

5. What Does This Program Do? (Branching)

What is the output for this program given the following inputs:

$a = 4, b = 5, c = 7$

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input a, b, c
if a^2 + b^2 == c^2 then
    ans = a * b / 2
else
    s = (a + b + c) / 2
    ans = sqrt(s * (s-a) * (s-b) * (s-c))
end if
output int(ans)
```

A. 96

B. 9

C. 10

D. 9.8

E. 14
